



## TUCSON MEDICAL CENTER HEALTHCARE

5301 E. Grant Road, Tucson, Arizona 85712, U.S.A.

Tucson Medical Center (TMC) is a community hospital with 673 licensed acute and psychiatric beds and 90 bassinets, serving the Tucson metropolitan area, Southern Arizona and northern Sonora, Mexico. The hospital is situated on 300 acres in the heart of Tucson and consists of over 1 million ft<sup>2</sup> (92,900 m<sup>2</sup>) of single-story construction, making it the largest single-story hospital in the United States. Heating, cooling and steam utilities are distributed from a central plant.

TMC is identified as one of the top 20 largest customers of Tucson Electric Power Co. (TEP) and is one of the largest customers for Southwest Gas (SWG) in the Tucson area. Electrical and gas utility consumption occurs primarily in the central plant. TMC Plant Services Department is constantly looking for opportunities to reduce operating expenses by limiting energy costs and optimizing energy use. TMC and TEP have participated in several projects, which have provided benefits for each. Lighting and motor retrofits, co-generation and thermal energy storage are several projects which provide equipment and systems that improve the operation at TMC and reduce the demands on production for TEP.

TMC was in the process of engineering and budgeting for replacement of two 600HP/6MW Ygnis boilers installed in 1978 and decided to partner with TEP and International Combustion Systems (ICS) on the project. ICS is startup company holding US patent rights for the Warga boiler and production facilities for boiler manufacturing and testing. The partnership was solidified and the boiler replacement project was initiated in 1998. TMC was to provide most of the installation and access for monitoring; TEP would provide engineering and construction oversight; and ICS was to provide three new boilers that would be the first of their kind installed with serial numbers 001, 002 and 003.

TMC and TEP representatives, in December 1998, observed a test firing, performed at the ASME certified factory in Slovenia. March, June and November of 1999, saw the start up of three 400HP/4MW Warga steam boilers providing 120-psi/8.3 bar steam for use in the central plant and throughout the hospital. Many differing benefits were expected by the parties involved with the project. Success of the project would be determined by attaining 10% improvement in boiler seasonal Input/Output efficiency. Monitoring through 2000 verified this goal was exceeded with a 14 – 15% improvement, although fuel-to-steam efficiency improved only 2%.

Many issues arose concerning new design techniques, certificates of operation, importation, local jurisdictions and operations. All issues were addressed as the project progressed through design, construction and commissioning.

The unique boiler design technique provided by Dr. Zeljko Warga, ICS founder, incorporating minimal number of tubes, cooled door, absence of refractory and maximum furnace heat exchange surfaces providing improved turn down efficiencies along with Autoflame combustion controls and Weishaupt burners has proven to be effective for the project at TMC. A method of accurately estimating payback and life cycle costs during the design phase was useful when justifying the project.

Verifying the accuracy of the predicted improvements, Fisher/Rosemount monitoring equipment, provides a sense of satisfaction that the project exceeds expectations for reduced operational expenses through the improved efficiencies of our boiler plant.

Richard Prevallet  
Director of Facilities